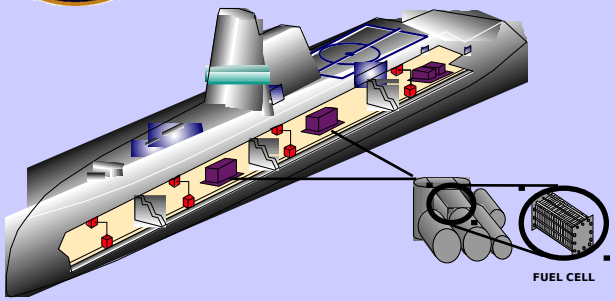
Hybrid Electric Vehicles

Tri-Service Power Exposition
July 16, 2003

Introduction

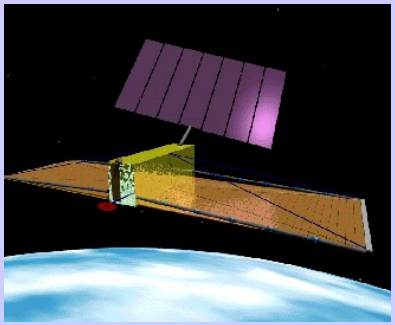
- **Overview 10:00 – 10:10**
  - Mr. Michael Gallagher
- **Hybrid Electric HMMWV Acquisition Program 10:10 – 10:30**
  - Mr. Scott Doudna
  - US Army Tank-automotive & Armament Command (TACOM)
- **USMC-DARPA RST-V Technology Demonstrator 10:30 – 10:50**
  - Mr. Michael Byerly
  - Office of Naval Research (ONR)
- **Army HEV Technology Programs and Benefits 10:50 – 11:10**
  - Mr. Calvin Kolp
  - National Automotive Center – TACOM
- **USMC Hybrid Electric Vehicle Intentions 11:10 – 11:20**
  - Mr. Michael Gallagher
  - Marine Corps Systems Command (MCSC)
- **Closing Comments / Questions 11:20 – 11:30**

Power …*Pervasive &*

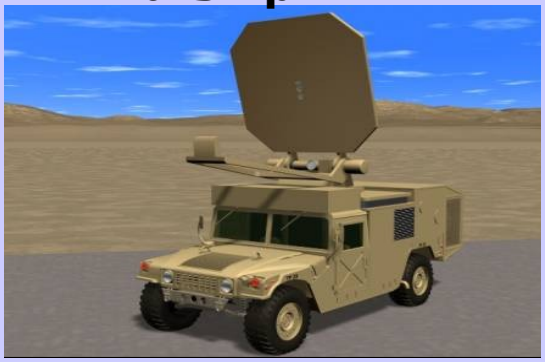


Electric Warship

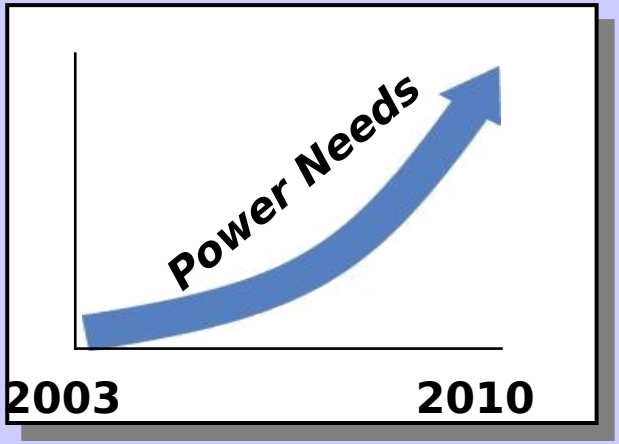
More Electric Aircraft



Space Systems



Less-than-Lethal Systems



Warfighter

Hybrid Electric Land Combat Vehicles & Weapons

Hybrid Electric Tactical Vehicles

Hybrid Electric Vehicle Benefits

- **Mobility**
  - Improved Fuel Economy
  - Improved Control over Tractive Effort (Traction Control)
  - Improved Marginal-Soil Mobility
  - Improved Acceleration
  - Improved Stability from Lower Vertical Center of Gravity
- **System Integration**
  - Flexibility in Component Placement
  - Redundant Modes of Operation
- **Value Added Features**
  - On-Board / Off -Board Electric Power
  - Engine-Off Power to Ancillaries / Mission Equipment
  - Engine-Off Movement (not necessarily “Silent Movement”)
  - Reduced Signatures (Thermal and Acoustic)

Classes of Electric Drive

Electric Powered
(single source)

Discontinued

Hybrid Electric Powered
(dual power source)

Parallel Hybrid

Model Year 2000

Model Year 2001

2004

2004

2004

Series Hybrid

Model Year 2006

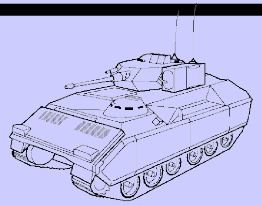
Long History of Electric Vehicles

DOD Investment: > $100M

50 tons
40 tons
30 tons
20 tons
10 tons
5 tons
1 ton

Army - Armored System Modernization

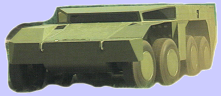
TARDEC-DARPA
Bradley HEV Demo

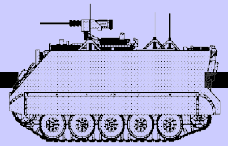


USMC - AAV Demo

NAC-OshKosh ProPulse

UDLP / GDLS FCS Demonstrato





TARDEC-UDLP-DARPA M-113 Technology Platform

NAC–S&S FMTV

NAC COMBATT

TACOM-TARDEC
HE-HMMWV

DARPA-USMC RST-V

Comm'l Electric Autos

Comm'l Hybrid-Electric Autos

Comm'l Hybrid-Electric SUVs

1980 1985 1990 1995 2000 2005 2010

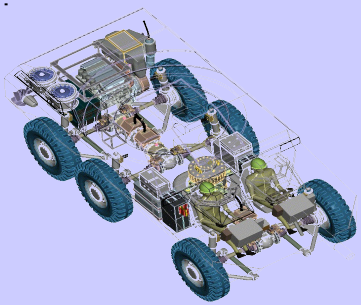
Army Hybrid Electric Programs

Military

M113

HMMWV

CHPS



AHED 8 x 8

LAV

M915

Dual Use

Class 8 Transit

Class 8

HEMTT

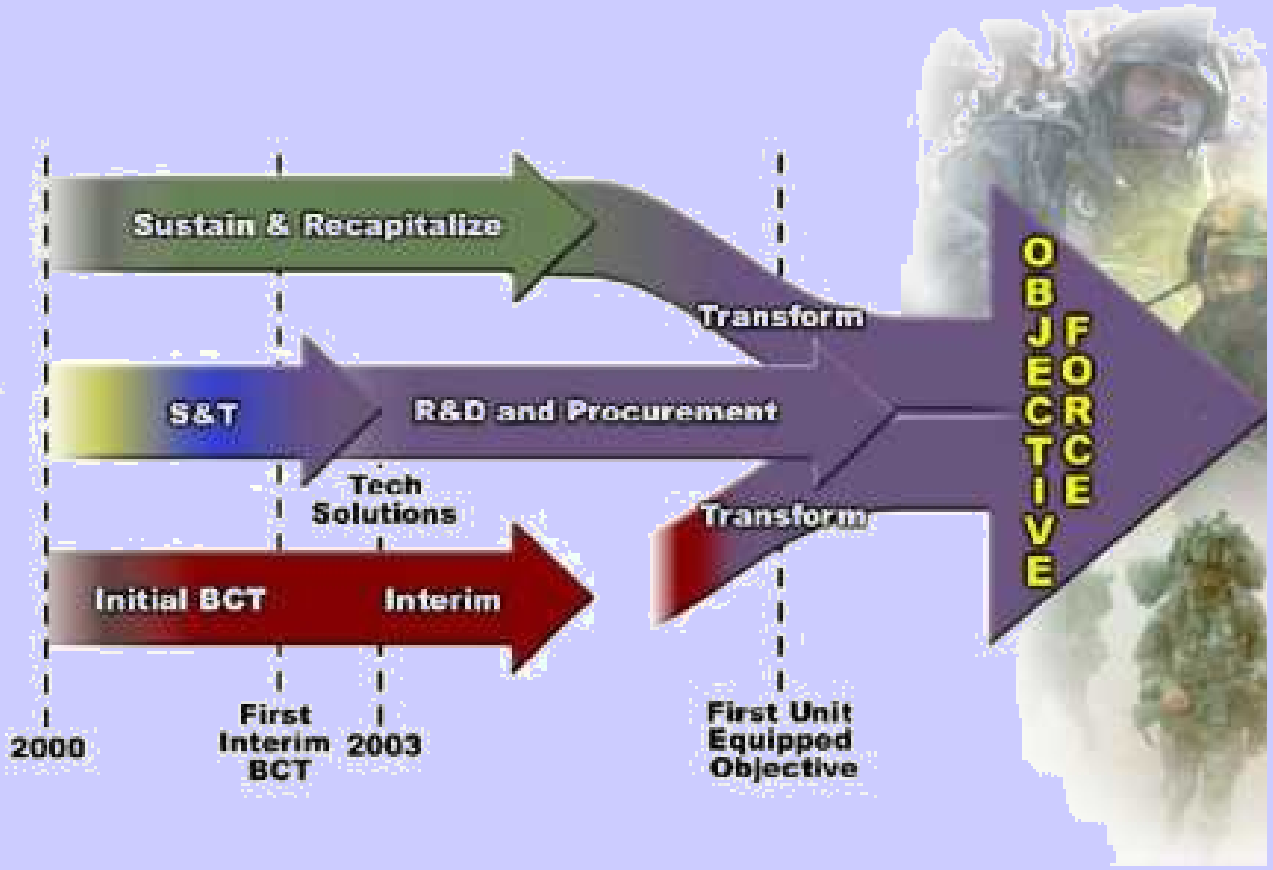
COMBATT

Hybrid Electric Technology for Army Transformation

Hybrid Hydraulic/Hybrid Electric FMTV

Future Tactical Truck System (FTTS)

Hybrid Electric HEMTT



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ACTD Threshold Capabilities

APPROVED FY04 ACTD

Sustainability

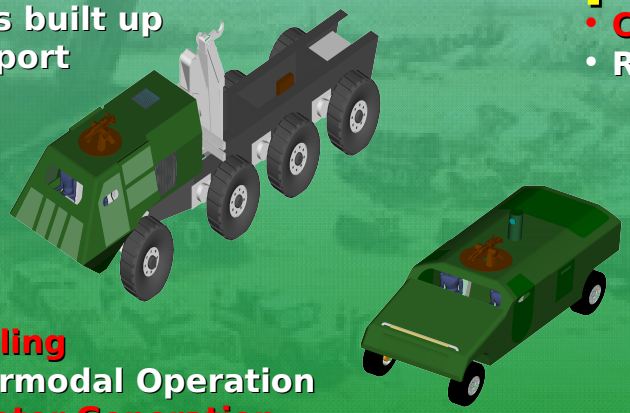
- Reliability – MTBF > duration of Pulsed Operations
- Maintainability – Self-reporting, no special tools, No TMDE, and No Spares

Agility

- Higher Mobility Rated Speed: 50% increase
- Must be able to go where FCS goes and bypass built up Areas to deliver support

Deployability

- C130 Roll on/Roll off w/load
- Ready to support off the ramp Without vehicle preparation or Transportability waivers



Lethality

Versatility

- Advanced Load Handling
- Interchangeable/Intermodal Operation
- On Board Power & water Generation
- Deliver integrated, common, formed Packaging

Survivability

- Designed upfront to provide time definite and assured delivery
- Reduced Emissions and Signature

Responsiveness

- Greater Fuel Efficiency 100 - 200%
- Dynamic Movement Tracking and Re-routing
- Greater Range 600 – 900 miles
- Integrated C4ISR

Hybrid Electric HMMWV Acquisition

Mr. Scott Doudna
US Army Tank-automotive & Armament Command